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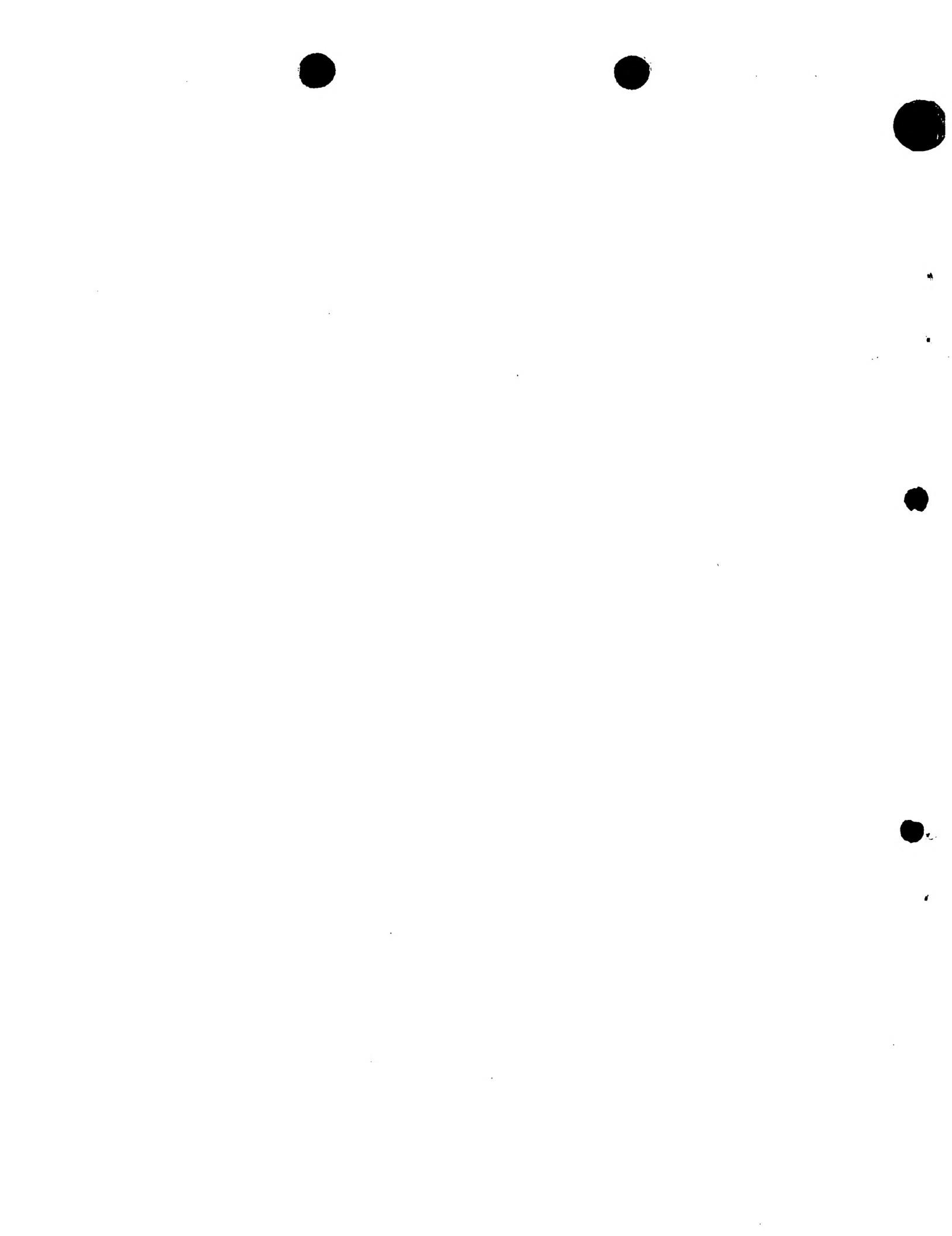
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**9913034.6**2. Patent application number  
(The Patent Office will fill in this part)3. Full name, address and postcode of the or of  
each applicant (*underline all surnames*)ALBRIGHT & WILSON UK LIMITED,  
210-222 HAGLEY ROAD WEST,  
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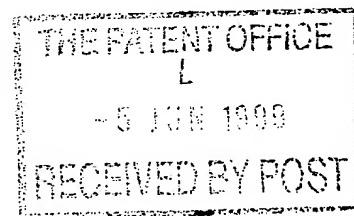
Patents ADP number (*if you know it*)If the applicant is a corporate body, give the  
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ENGLAND

4. Title of the invention POLYMERISABLE SURFACTANTS

5. Name of your agent (*if you have one*)"Address for service" in the United Kingdom  
to which all correspondence should be sent  
(*including the postcode*)

Barker Brettell

138 Hagley Road  
Edgbaston  
Birmingham  
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Mr C D Kinton

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## POLYMERISABLE SURFACTANTS

The present invention relates to polymerisable surfactants comprising at least one hydrophobic polymerisable group which is linked by polyalkyleneoxy groups to a hydrophilic group. The surfactants are particularly useful in emulsion-polymerised surface coatings. The present invention also relates to a method of making the polymerisable surfactants, to uses thereof, and to surface coatings including the surfactants.

10

Polymerisable surfactants are known in the art and have often been used in surface coatings. However, such prior-art surfactant-containing coatings have a tendency to absorb moisture resulting in partial detachment of the coating, a problem known as "bloom". The problem of 15 "blush", a whitening effect of a coating when subjected to prolonged immersion in water, is also evident in coatings containing prior-art surfactants.

The object of the present invention is to provide a polymerisable surfactant which is particularly suitable for use in surface coatings, which has improved water resistance and which reduces the problems of "bloom" and "blush" in coatings. A method of making such a polymerisable surfactant is also provided.

25 According to a first aspect, the present invention provides a polymerisable surfactant having at least one hydrophobic polymerisable group which is linked by polyalkyleneoxy groups to a hydrophilic group, wherein the polymerisable surfactant is of the general formula:

(RCH = CR'COO [CH<sub>2</sub>CHR''O]<sub>x</sub>)<sub>n</sub> PO (OY)<sub>m</sub>

where n + m = 3

x is between 5 and 40

R = H or CH<sub>3</sub> or COOR'''

5 R' = H or CH<sub>3</sub>

R'' = H, CH<sub>3</sub> or C<sub>2</sub>H<sub>5</sub>

R''' = C<sub>1</sub> - C<sub>20</sub> alkyl

Y = H or an alkali metal atom

- 10 Preferably the hydrophobic polymerisable group represented by RCH=CR'COO is acrylate or methacrylate, in which case R is hydrogen and R' is hydrogen or methyl respectively.

- 15 The hydrophobic polymerisable group may alternatively be maleate, fumarate, crotonate or isocrotonate.

Preferably x is between 10 and 30, more preferably 17 and 22, most preferably x is 20.

- 20 Preferably the oxyalkylene groups represented by [CH<sub>2</sub>CHR''O] comprise mainly propyleneoxy groups. For example, from 80% - 100% of the oxyalkylene groups may be propyleneoxy groups. Preferably, at least 90%, more preferably at least 95% and most preferably at least 98% of the oxyalkylene groups are propyleneoxy groups.

25

The balance of the oxyalkylene groups not being propyleneoxy groups is preferably selected from ethyleneoxy or butyleneoxy groups.

- 30 The oxyalkylene groups as well as acting as linking groups, in fact form the main hydrophobe in the polymerisable surfactant.

Preferably the hydrophilic group represented by  $\text{PO}(\text{OY})_m$  is a phosphate group, i.e. Y represents hydrogen. Alternatively, the hydrophilic group may be a water-soluble phosphate salt group, for example alkali metal phosphate, in which Y represents an alkali metal atom.

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- Although it is not intended that the present invention be construed with reference to any particular theory, it is believed that surfactants according to the present invention exhibit improved water-resistance in comparison with prior-art surfactants because they do not include a non-ionic hydrophilic group, such as polyethylene oxide. In many prior-art polymerisable surfactants, a hydrophilic non-ionic group is present which can give rise to poor water sensitivity in a final coating. Ionic groups are only hydrophilic when ionised and therefore the resultant dried coatings are less hydrophilic and less water sensitive than coatings including non-ionic hydrophiles.

According to a second aspect, the present invention provides a method of making a polymerisable surfactant according to the first aspect of the present invention, the method comprising the steps of:

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- reacting an unsaturated carboxylic acid corresponding to the hydrophobic group with an alkylene oxide corresponding to the oxyalkylene linking group while maintaining the temperature of the reaction below that at which spontaneous polymerisation of the unsaturated groups of the hydrophobic group would occur; and

phosphating the resultant polyalkoxylated hydrophobic group.

- The polyalkoxylation process step may be carried out with the aid of a catalyst. The catalyst is preferably a catalyst for alkoxylation which does

not catalyse the polymerisation of unsaturated groups of the hydrophobic group.

A preferred catalyst for alkoxylation is a strong Lewis acid such as boron  
5 trifluoride.

Preferably, a portion, most preferably a small portion, of the catalyst for  
alkoxylation is added to the unsaturated carboxylic acid before the  
10 alkylene oxide. Preferably the bulk of the catalyst is added with the  
alkylene oxide. A remaining portion of the catalyst is preferably added  
after completion of addition of the alkylene oxide to maximise conversion  
as the catalyst has a short active life. Hydroquinone is preferably added  
to the reaction mixture after the addition of the remaining portion of the  
catalyst. The hydroquinone is added to inhibit autopolymerisation of the  
15 unsaturated groups of the hydrophobic group. Any unreacted alkylene  
oxide may be removed, preferably by sparging with air.

Preferably, the reaction of the unsaturated carboxylic acid and the  
alkylene oxide is carried out in an inert atmosphere, for example under  
20 nitrogen. The reaction mixture may be stirred. Preferably, moisture is  
excluded from the reaction mixture. Preferably, the alkylene oxide is  
added continuously at a constant rate over a given time period, suitably 90  
minutes.

25 The phosphorylation step is preferably carried out by means of phosphorus pentoxide. The most preferred form of phosphorus pentoxide is the solid form. The phosphorus pentoxide may be added over a given period of time, preferably one hour. Preferably, when addition of the phosphorus pentoxide is complete, the resulting mixture is maintained at an elevated  
30 temperature, such as 80°C, for about 4 hours, with stirring.